

**WHAT IS CLAIMED IS:**

1. An encoding apparatus for encoding input information data using LDPC (low density parity check) codes and transmitting encoded data to a decoding apparatus in a hybrid automatic repeat request system, the encoding apparatus comprising:

a first LDPC code encoder for performing LDPC code encoding on the input information data and transmitting the encoded data to the decoding apparatus;

an interleaver for interleaving the input information data; and

a second LDPC code encoder arranged in parallel with the first LDPC code encoder, for performing LDPC code encoding on an output of the interleaver,

wherein the first LDPC code encoder transmits an output signal to the decoding apparatus at odd numbered retransmissions in response to a retransmission request from the decoding apparatus, and

the second LDPC code encoder transmits an output signal to the decoding apparatus at even numbered retransmissions in response to the retransmission request from the decoding apparatus.

2. The encoding apparatus of claim 1, further including an encoding controller for controlling the first LDPC code encoder for odd numbered retransmissions and controlling the second LDPC code encoder for even numbered retransmissions, when receiving a retransmission request from the decoding apparatus.

3. The encoding apparatus of claim 1, wherein the first LDPC code encoder and the second LDPC code encoder have the same generating matrix and parity check matrix.

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4. The encoding apparatus of claim 3, wherein the first and second LDPC code encoders perform retransmission according to a Chase combining scheme in response to the retransmission request from the decoding apparatus.

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5. A decoding apparatus for decoding LDPC code encoded codewords received from an encoding apparatus in a hybrid automatic repeat request system, the decoding apparatus comprising:

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a first LDPC code decoder and a second LDPC code decoder for performing LDPC code decoding on an LDPC code coded codeword transmitted from the encoding apparatus;

an interleaver for interleaving an output of the first LDPC code decoder and outputting the interleaved data to the second LDPC code decoder; and

a deinterleaver for deinterleaving an output of the second LDPC code decoder and outputting the deinterleaved data to the first LDPC code decoder,

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wherein the first LDPC code decoder performs decoding on the codeword newly received from the encoding apparatus and an odd numbered codeword retransmitted from the encoding apparatus due to a transmission error,

the second LDPC code decoder performs decoding on an even

numbered codeword retransmitted from the encoding apparatus due to a transmission error,

the codeword newly transmitted from the encoding apparatus is processed and then finally outputted from the first LDPC code decoder, and

5 the codeword retransmitted from the encoding apparatus is processed and then finally outputted from the deinterleaver.

6. The decoding apparatus of claim 5, further including:

10 a CRC (cyclic redundancy code) check unit for performing CRC checking on the outputs of the first and the second LDPC code decoders; and

a decoding controller for determining whether or not the decoding is successful according to a result of the CRC checking, feeding back a checking result to the encoding apparatus, and controlling the first and second LDPC code decoders to receive the newly transmitted codeword and retransmitted  
15 codeword and perform decoding on them.

7. The decoding apparatus of claim 5, wherein the first LDPC code decoder performs decoding on the odd numbered retransmitted codeword using the output of the deinterleaver.

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8. The decoding apparatus of claim 5, wherein the second LDPC code decoder performs decoding on the even numbered retransmitted codeword using the output of the interleaver.

9. The decoding apparatus of claim 5, wherein when the retransmission is requested due to a CRC check failure on the output of the first LDPC code decoder, the second LDPC code decoder receives an even numbered retransmitted codeword from the encoding apparatus.

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10. The decoding apparatus of claim 5, wherein when the retransmission is requested due to a CRC check failure on the output of the second LDPC code decoder, the first LDPC code decoder receives an odd numbered retransmitted codeword from the encoding apparatus.

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11. An encoding apparatus for encoding input information data using LDPC (low density parity check) codes and transmitting encoded data to a decoding apparatus in a hybrid automatic repeat request system, the encoding apparatus comprising:

15       a first LDPC code encoder for performing LDPC code encoding on the input information data and transmitting the encoded data to the decoding apparatus;

          an interleaver for interleaving the output of the first LDPC code encoder; and

20       a second LDPC code encoder connected in series with the first LDPC code encoder, for performing encoding on an output of the interleaver, and transmitting encoded data to the decoding apparatus;

          wherein the first LDPC code encoder performs an odd numbered retransmission on the input information data according to a retransmission

request from the decoding apparatus;

the second LDPC code encoder performs an even numbered retransmission on the input information data according to the retransmission request from the decoding apparatus; and

5 the codeword transmitted by the encoding apparatus is finally output by the first LDPC code decoder.

12. The encoding apparatus of claim 11, further comprising an encoding controller for controlling the first LDPC code encoder for odd  
10 numbered transmission and controlling the second LDPC code encoder for even numbered transmission when the decoding apparatus requests a retransmission.

13. The encoding apparatus of claim 11, wherein the first and second  
15 LDPC code encoders perform retransmission according to a Chase combining scheme in response to the retransmission request from the decoding apparatus.

14. A decoding apparatus for decoding codewords, encoded with LDPC codes, received from an encoding apparatus in a hybrid automatic repeat  
20 request system, the decoding apparatus comprising:

a first LDPC code decoder and a second LDPC code decoder for performing LDPC code decoding on the codeword transmitted from the encoding apparatus;

an interleaver for interleaving an output of the first LDPC code decoder

and outputting a result to the second LDPC code decoder; and

a deinterleaver for deinterleaving the output of the second LDPC code decoder and outputting a result to the first LDPC code decoder,

wherein the first LDPC code decoder performs decoding on a codeword newly received from the encoding apparatus and an odd numbered codeword retransmitted from the encoding apparatus due to a transmission error, and

the second LDPC code decoder performs decoding on an even numbered codeword retransmitted from the encoding apparatus due to the transmission error.

15. The decoding apparatus of claim 14, further including:

a CRC check unit for performing CRC checking on the output of the first LDPC code decoder; and

a decoding controller for determining whether or not the decoding is successful according to a result of the CRC checking, feeding back a checking result to the encoding apparatus, and controlling the first and second LDPC code decoders to receive the newly transmitted codeword and retransmitted codeword and perform decoding on them.

16. The decoding apparatus of claim 14, wherein the first LDPC code decoder performs decoding on the odd numbered retransmitted codeword using the output of the deinterleaver.

17. The decoding apparatus of claim 14, wherein the second LDPC

code decoder performs decoding on the even numbered retransmitted codeword using the output of the interleaver.

18. The decoding apparatus of claim 14, wherein the retransmission request is sent to the encoding apparatus when the output of the first LDPC code decoder fails to pass the CRC checking.

19. The decoding apparatus of claim 14, wherein when the output of the first LDPC code decoder corresponding to the odd numbered retransmitted codeword fails to pass the CRC checking, the output of the first LDPC code decoder is recursively decoded through the interleaver, the second LDPC code decoder, the deinterleaver, and the first LDPC code decoder.

20. The decoding apparatus of claim 14, wherein when the output of the first LDPC code decoder corresponding to the even numbered retransmitted codeword, which is processed by the second LDPC code decoder and deinterleaver, fails to pass the CRC checking, the output of the first LDPC code decoder is recursively processed by the interleaver, the second LDPC code decoder, the deinterleaver, and the first LDPC code decoder.